

**TECHNOLOGY NEEDS/OPPORTUNITIES STATEMENT
REMOTE MONITORING FOR STRUCTURAL INTEGRITY NEED**

Identification No.: RL-DD38-S

Date: November, 2001

Program: Environmental Restoration

OPS Office/Site: Richland Operations Office/Hanford Site

PBS No.: RL-CP01

Waste Stream: LLW Debris (ER-05, risk = 4) and MLLW Debris (ER-02, risk = 4)

TSD Title: N/A

Operable Unit (if applicable): N/A

Waste Management Unit (if applicable): N/A

Facility: Materials Processing Facilities

Priority Rating:

This entry addresses the "Accelerated Cleanup: Paths to Closure (ACPC)" Priority: Select a "1", "2" or "3" to assess the impact of the need/opportunity relative to the current site baseline.

- ☐ 1. Critical to the success of the ACPC
- ☒ 2. Provides substantial benefit to ACPC projects (e.g., moderate to high lifecycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays)
- ☐ 3. Provides opportunities for significant, but lower cost savings or risk reduction, and may reduce uncertainty in ACPC project success.

Need Title: Remote Monitoring For Structural Integrity Need

Need/Opportunity Category: Science Need

Need Description:

Cost-effective, remote recording sensors are needed for the evaluation of the integrity of structures including steel tanks, concrete foundations, walls, and roofing materials.

In order to make sensors that can assess the integrity of structures, the physics and chemistry of the degradation mechanisms of structural materials must be well understood so that the detection of these processes can be performed. In addition, sensors must be developed that can evaluate unexpected stresses to the structural members so that early warning of potential failures can be achieved. A final consideration for these sensors is that they must be able to be fitted into and on existing structures. For roofing materials, the sensors can be added during the resurfacing of the roofs when the current lifetime is exceeded (PUREX, B-Plant, and 224-B are all due for new roofs within the next 5 years). This will include the development of new construction materials, development of new techniques for detection and quantification of the analytes of interest, and new methods for remote/centralized collection of the data obtained by the sensors. This will necessarily include looking at the fields of electronics, electrical engineering, mechanical

engineering, microfluidics, and chemical physics to better understand the underlying principles of sensor design and development.

Schedule Requirements:

Earliest Date Required: 9/30/2003

Latest Date Required: 9/30/2025

Problem Description:

There are numerous structures on the Hanford site which are in various stages of decontamination and decommissioning, ranging from those that have not yet been worked on to those that are in a final disposition state. Current practices for the evaluation of these structures involve the visual and physical inspection of the structure by trained inspectors. In the case of roof inspections, this requires that an inspector must walk onto the roof to look for tell tale signs of failure, and for other parts of structure requires the inspectors to enter situations with difficult access (e.g. entry into confined spaces and entry into radiation areas. In the case of roof inspections, the physical act of the inspection can cause failures and will decrease the life of the roofing materials. Some remote techniques have been used to evaluate the condition of structures, such as the use of infrared cameras to determine the presence of water between the roofing material and actual roof, but this is costly is of limited value in the overall determination of the integrity of the roof.

Potential Life-Cycle Cost Savings of Need (in \$000s) and Cost Savings Explanation:

This need supports multiple technology that have individual cost savings associated with them.

Benefit to the Project Baseline of Filling Need:

The development of new sensors will drastically reduce the requirement for physical inspections. This will not only prolong the life of some of the structures, but will also decrease the risks associated with physical inspections. It will also allow for continuous real-time measurement to catch potential failures early, decreasing the cost of repair, if required, as well as reducing risk to health and the cost of long-term monitoring.

✕ Cost Savings ✕ Risk Reduction ✕ Enabling Knowledge

This Science Need also supports the following Hanford Technology Needs: RL-DD052, RL-DD055, RL-DD057

Relevant PBS Milestone: PBS-MC-030

End-User: Environmental Restoration Contractor

Contractor Facility/Project Manager:

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